IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Zagoskin	Art Unit: 2814
	Examiner: Douglas A. Wille
Serial No. 09/452,749 Filed: December 1, 1999	Attorney Docket: 11090-003-999
For: Permanent Readout Superconducting Qubit	

DECLARATION OF DR. ALEXANDER TZALENCHUK UNDER 37 C.F.R. § 1.132

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, ALEXANDER TZALENCHUK, declare and state as follows:

1. I am a citizen of Russia currently residing at 244 Ashburnham Road, Ham / Richmond, Surrey, United Kingdom TW10 7SA.

2. I am familiar with the specification and claims of the above-identified patent application ("Application"), the Office Action mailed February 19, 2003, United States Patent 5,157,466 to Char *et al.* (hereinafter "Char *et al.*") and Tinkham, *Introduction to Superconductivity*, Second Edition, (hereinafter "Tinkham").

3. I am an employee of the National Physics Laboratory of the United Kingdom of Great Britain and Northern Ireland and its affiliate NPL Management Limited (herein after "NPL"). NPL is located in Teddington, Middlesex, UK, TW11 0LW, where I am employed by it as a Senior Research Scientist in its Fundamental and Wavelength Standards Team. NPL has entered into a collaborative research agreement with D-Wave Systems Inc.

(hereinafter "D-Wave"), the assignee herein, dated March 27, 2002, whereby NPL carries out certain research and measurement work for D-Wave. One product of this research and measurement work is the creation of certain intellectual property, including patent applications, all rights, title and interest to which are held by D-Wave pursuant to the terms and conditions of the aforementioned collaborative research agreement.

4. I received a B.A. in Electronics Engineering from the Chair of Crystal Physics, Faculty of Electronic Materials and Devices, Moscow Steel and Alloys Institute and a Ph.D. in Physics and Mathematics from the A.V. Shubnikov Institute of Crystallography Russian Academy of Sciences, and have been actively performing research in the field of solid state and superconducting fabrication and characterization for the past nineteen years. During that time, I have published in excess of 35 articles in the fields of solid state physics, superconducting structure fabrication, and characterization of superconducting structures and have six allowed or issued patents. My research experience encompasses work in semi conductor structures formed on bi-crystal substrates, bi-crystal substrates for high-Tc superconductors, mesoscopic effects in high-Tc superconductors, Josephson phenomena in high-Tc bi-crystals and bi-epitaxial grain boundary Josephson junctions, and Josephson phenomena in high-Tc step edge Josephson junctions, and qubits using high-Tc Josephson junctions. I am a specialist in the fabrication of microstructures in high-Tc superconducting devices, these include three terminal devices, SQUIDs, and qubits. I have additional expertise in the characterization of superconducting devices including instrumentation for scanning SQUID/Hall microscopy, and investigation of local magnetization and superconductivity. I have received an individual George Soros Foundation grant, on the basis of high citation index, and the Swedish Foundation for International Cooperation in Research and Higher Education, through a program to bring eminent foreign scientists and scholars to Sweden.

5. I declare that a clean Josephson junction formed using a d-wave superconducting material is defined by a current-phase relationship in which the second harmonic makes a distinct contribution to the current-phase relationship of the clean Josephson junction.

6. I declare that the second harmonic effect on the current-phase relationship of a clean Josephson junction formed using a d-wave superconducting material is temperature dependent.

7. I declare that, in the current state of the art, the second harmonic effect on the current-phase relationship of clean Josephson junctions formed using d-wave superconducting material cannot be precisely engineered.

8. I declare that, because of the temperature dependence of the second harmonic effect and the inability to precisely engineer the second harmonic effect, it would be undesirable to form a dc SQUID using clean Josephson junctions in a d-wave superconducting material, such as $YBa_2Cu_3O_{7-x}$ (YBCO), when the dc SQUID is intended for use in commercial SQUID magnetometers such as those described in Char *et al.*

9. I declare that Chapter 7 of Tinkham only considers conventional superconducting materials and devices made out of conventional superconducting materials.

10. I declare that, based on my experience in the field of bi-epitaxial technology, neither the bi-epitaxial technology described in Char et al. nor the best quality crystal structures available for bi-epitaxial Josephson junction technology were sufficiently advanced at the time of filing of the Application to prepare a clean Josephson junction such as that

described in the Application.

11. I further declare, under penalty of perjury under the laws of the United States of America, that all statements made herein of my own knowledge are true and that these statements were made with the knowledge that willful false statements and the like are

punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: 16/04/03

Dr. Alexander Tzalenchuk